

CONCEPTUAL DESIGNS FOR IN SITU ANALYSIS OF MARS SOIL

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The Viking Biology results, and the absence of organic material in the soil of Mars have led to the suggestion that there is one or more oxidants in the martian soil. Based upon the results of the Gas Exchange Experiment and the Labeled Release Experiment, Klein (Icarus, **34**, 666, 1978) suggested the presence of three oxidants: a strong thermally stable oxidant, a strong thermally labile oxidant, and a weak oxidant.

The nature and concentration of oxidants in the martian soil has two important implications: for exobiology, the preservation of organic material from an early biological period on Mars; and for human exploration, the health and safety of astronauts on the surface. As indicated by the absence of organic material in the near surface at the two Viking sites, the oxidant may have destroyed any organic material to some depth. The depth from which samples must be returned if there is to be any hope of finding organic material on Mars will depend on the nature of the soil oxidants and their mobility through the soil. For human explorers the soil oxidant may pose a hazard to material and equipment as well as a health hazard due to the inevitable movement of dust within the habitat.

The goal of this research is to develop conceptual designs for instrumentation to perform in situ measurements of the Martian soil in order to determine the existence and nature of any reactive chemicals.

Our approach to this problem involves three aspects: 1) Assessment and critical review of the Viking Biology results which indicated the presence of a soil oxidant. 2) An investigation of the possible application of standard soil science techniques to the analysis of Martian soil. 3) Preliminary consideration of non-standard methods that may be necessary for use in the highly oxidizing Martian soil.

Based on our preliminary analysis we have developed strawman concepts for standard soil analysis on Mars, including pH, suitable for use on a Mars rover mission. In addition, we have devised a method for the determination of the possible strong oxidants on Mars.